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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 102 MAY, 1930 NO. 5

EDITORIAL

THE PHARMACOPŒIAL CONVENTION

EVERY DECENNIUM—on the decennium—the Convention of the United States Pharmacopœia foregathers in Washington in order to prepare a revision of that important book of standards.

The 1930 Convention has come and gone. A new Committee of Revision was chosen, and as chosen, evidenced sufficient sound sense to elect for its chairman the same gentleman who had so wisely and so efficiently served in that capacity during the preceding decennium.

Yet before the wise thing was done the body pharmaceutic suffered many a convulsion.

It seems that coincident with these pharmacopœial conventions the body pharmaceutic breaks out in a fearful rash.

Nor is this rash so sudden. For long before the cohorts meet at Washington evidences of infection are most apparent.

A general uneasiness throughout the body—erratic rises in temperature, a relative and absolute increase in meddlesome leukocytes, attacks of insomnia, gatherings here and there, profuse and unnecessary sweating, incoherency of speech, incoordination of effort—these are the pre-conventional symptoms that positively point to the coming fever and rash.

Petty politics, engineered by pettier politicians, masquerading as scientists; geographic conceits fostered by prejudiced provincials, and unbridled ambitions hard-ridden by a crowd of incompetents—these are the unpleasantnesses of a pharmacopœial convention.

> "Physicians should dictate the medical or therapeutic scope of the Pharmacopœia."

That was the intelligent viewpoint of the experienced chairman of the Revision Committee.

And that seems to be the only fair and sane viewpoint.

Yet with this moot question, as with a good many others, certain pharmaceutic "experts" voiced a lack of faith in the competence of medical authorities to handle even their own specific medical problems.

Nor did this attitude assist any in the furtherance of harmony between the medical and the pharmaceutical groups in attendance upon the convention.

Indeed, it became necessary to effect a fusion of the medical group with the saner stratum of the pharmaceutical group in order to carry through certain plans which would insure a wise guidance of pharmacopœial progress during the next ten years.

It seems certain that unless Pharmacy presents a saner and a more united front at the convention ten years hence—it may well be that the organization of medicine with headquarters at Chicago, aided and abetted by governmental bureaus, will take away from organized Pharmacy its beloved Pharmacopœia, the last real stronghold of professionalism it possesses.

IVOR GRIFFITH.

ORIGINAL ARTICLES

IODIZED SALT—A FOOD OR A DRUG?*

By D. W. Horn, Ph. D.

Professor of Physics and Physical Chemistry at the Philadelphia College of Pharmacy and Science

IN RECENT YEARS a table salt known as "Iodized Salt" has made its appearance on the market. In some sections its sale is advanced by advertising propaganda directed, for the most part, along the lines customary in vending patent medicines, at times with the addition of some recommendation by the State or local board of health. The argument for the use of iodized salt is, as a rule, cogent, and bears no obvious suggestion of the fact that this cogent argument may be fallacious. In other sections of the country iodized salt is merely offered for sale and dispensed as any other grocery.

*One of a Series of Popular Science Lectures delivered at the Philadelphia College of Pharmacy and Science, 1929 Season.

Two questions call for an answer here. First, why has iodized salt appeared here only in recent years? Second, in what sense may the argument recommending its use as a food be fallacious?

If we wish to know why iodized salt came into prominence within the last decade we must inquire into its nature and into the possible motive back of its introduction. Iodized salt may be defined as table salt (sodium chloride, NaCl), which, in the process of refining is made to contain a certain amount of potassium iodide (KI) or sodium iodide (NaI). A commonly mentioned proportion of iodine to chloride in domestic iodized salt is 1:5000. The market yields samples of varying composition, however, due to uncertainties in the preparation and to the gradual loss of iodine from some samples during storage. Since salt is said to be the second, that is, next to water, among the common articles of food, it may be surmised that in iodized salt the salt is merely a vehicle to convey iodides to the consumer. This surmise is correct.

The fact that you learned of iodized salt within the last decade in no way suggests, of course, the fact that in 1840 its use was started in Geneva, and later stopped by the medical profession, and that in 1859 the possibilities of harm from its use were unequivocably stated in medical literature. It was then, at that early date, set forth that one cannot watch too attentively the administration of iodine to people of forty years of age or over and that it is imperative to stop its use upon the first symptoms of saturation. The iodized salt there referred to was 1 : 10,000, *i. e.,* one-half as strong in iodine content as our domestic article. Aside from iodized salts, precautions were urged as to the use of other iodine preparations as early as 1821—over one century ago—by the very advocate of their usefulness in the connection in which we deal with iodine tonight.

The first reply to an inquiry as to the aim in giving iodides would naturally be that it is probably done for some medicinal purpose. This reply is correct. Most of us are brought immediately to our feet upon considering this reply, for most of us are of the opinion that *medication involves individuality,* and is safe and satisfactory for us only when entrusted to someone in whom we have confidence, someone who knows our idiosyncrasies and who is at hand to observe the results and to modify the treatment in accordance with our requirements whenever necessary. This feeling on our part rests upon both prejudice and experience and is more intense when our offspring are involved. There is something too fundamental about this reaction

for it to be ignored or quietly circumvented. I think it would be commonly regarded as prudent to deal in all such matters with the utmost candor.

Every medicinal procedure aims at disease. Sometimes it is a fight in the forward trenches where we look the enemy in the eye; sometimes it is a bombardment from a distance equal to the longest range of our guns, but naturally disease is always the enemy. Hence we are led to inquire as to what disease it is that is aimed at in the promiscuous dosing with iodides *via* iodized salt.

The answer is goiter—a disease of the thyroid gland, a disease resulting from the disturbed functioning of this gland. It is probably a fair statement that there are at least three diseases of this kind recognized. The first is that in which the gland atrophies and its functional activity diminishes. When this occurs in the early years of childhood it is congenital. Cretinism, as it is called, involves retarded mental growth as well as retarded physical growth, including retarded sexual development. Myxedema is another form of this thyroid disease, confined mainly to women of from thirty to fifty years of age. It is accompanied by a lowered metabolism, a loss of expression and of memory, a thickening of the skin and infiltration of a peculiar mucoid edema.

Contrasting with this first thyroid disease where the gland atrophies comes the second thyroid disease, where the gland enlarges and its functional activity increases. Exophthalmic goiter, as it is called, involves a rapid heart beat and high blood pressure, tremor and nervousness, and protrusion of the eyeballs. In these two diseases the increase or decrease in functional activity of the gland is reflected in the so-called basal metabolism. Basal metabolism is measured in the laboratory by the heat production when the body has come to complete rest. The measurements are stated in calories per square meter of body surface. In cretinism and myxedema this number of calories is less than normal; in exophthalmic goiter the number of calories is greater than normal.

In addition to these two diseases of the thyroid there is a third, usually called simple goiter. It is accompanied by little or no general constitutional disturbance. It is non-toxic. The greater or less enlargement of the thyroid gland which accompanies it is usually regarded as probably compensatory for some insufficiency in the body-intake, and possibly for some changes during normal physiological body readjustments. It is at this third disease—simple goiter—that

iodized salt is aimed. It is demonstrable that iodine can cause many simple goiters to disappear or to become reduced in size.

Inquiry as to why iodine may be expected to affect the thyroid gland leads us to the following circumstantial chain of thought: Iodine is a normal constituent of the thyroid gland. The true secretion of the thyroid gland is an iodine compound containing about 61 per cent. by weight of iodine. The chief function of thyroxin is to regulate the rate of metabolism. As little as one milligram of thyroxin given to a child will cause an increase of 2 per cent. in the basal metabolism. The normal healthy human thyroid gland contains about thirty milligrams of iodine. This is about 1/1000 of an ounce (apothecaries' weight), and amounts to approximately 4/100,000 of 1 per cent. of the weight of the human body (150 lbs.). Usually one to two milligrams of iodine are present per gram of gland. The iodine content of the gland shows a seasonal variation, the maximum occurring in summer or early autumn. When the amount falls below a certain minimum, enlargement of the gland takes place.

A train of reasoning is now within grasp. Insufficient iodine in the body-intake or an excessive daily demand may cause a thyroid disturbance. Conversely, a thyroid disturbance ought to subside if iodine is added to the intake. Just how such reasoning will command your respect may be shown by reference to Moleschott's famous saying. Upon discovery that there is phosphorus in the human brain he said, "No phosphorus, no thought." Now let us indulge ourselves in a train of reasoning: Thoughtless people must be short in phosphorus; thoughtless people are a nuisance and a burden; therefore we will give all of us phosphorus. This will cure the thoughtless of thoughtlessness and insure the thoughtful of a very plentiful excess of phosphorus for their thinking. It happens to be true that we might relieve the thoughtless of all thoughtlessness, for phosphorus is a poison and all of us might, in the extreme cases, pass out of life together, by the same token. At least, with Hamlet, we might be said to be "sick of overthought."

This illustration is not strictly fair, for nothing is ever exactly like any other given thing, but it will suffice to illustrate how our thoughts in such matters may or may not deserve our confidence. At this point, lest you misunderstand your lecturer, let me say that this discussion tonight is not a theoretical one in the sense of being divorced from the practical aspects of the matter. Your speaker has for years been an ardent health worker and he is also one who must bear to his

grave the unsightly scars of poisoning by iodized table salt,—for iodine poisoning may leave scars.

The next line of inquiry relates to the progress in knowledge of goiter which brought attention to it and to iodized salt. Goiter is a very ancient medical subject. It is said that the opinion that drinking water is the cause of goiter is at least as old as Hippocrates and Aristotle. The acid test of experience may be said to have been applied to this idea, since it is a matter of record, both in France and in Italy, that the drinking of certain waters has been resorted to in order thereby to gain exemption from military conscription. Goiter, common in a jail, has been seen to disappear when the drinking water has been changed. In the same village and under the same conditions of social life those who drank a particular water suffered, while those who drank another water escaped.

The case against water as a cause of goiter is commonly regarded as a strong one. During the military conscription in the United States for the World War data upon the prevalence of goiter was incidently made available. Upward of two million men from all parts of the country were examined physically; and when the results are classified by States for the prevalence of goiter, a striking picture appears. It can only be regarded as natural that the reaction would lead to some study of the water supplies of the States where goiter was more common.

It should also be made known to you that in the last century the learned Frenchman, Chatin, advanced the hypothesis that simple goiter is correlated with the low iodine content of the drinking water. The drinking water thus far examined throughout those parts of the United States shown by the World War draft to have higher incidence of goiter have proven to be relatively low in iodine content.

Prior to the war and since then quite a number of surveys of school children have been made and these furnish further data. The figures show varying incidence of goiter ranging from 9 per cent. to perhaps 55 per cent. Presumably the figures are not all equally convincing. In one instance about half of the cases of goiter reported were "very slight." Just what is a healthy enlargement of this gland and what is diseased enlargement, is still uncertain. However, there is no doubt that with advancing age, from early childhood on, there is a steady increase in the incidence of greater or less thyroid enlargement among boys, beginning at the age of six and reaching a peak between twelve and fourteen years, and thereafter showing a gradual decrease until

eighteen years is reached. Among the girls the increase in percentage incidence of enlargement is steady from six to sixteen years. It should be borne in mind that one cannot consider one gland of the body, say the thyroid, without considering the others also, for it seems indisputable that the glands are interrelated and in some sense interdependent.

"The thyroid has some relationship to the sex organs, the nature of which is but poorly understood. . . . There is even an increase in size of the thyroid at puberty and during menstruation, pregnancy, and lactation." In the king scorpion the thyroid is said to be the organ of reproduction.

As to the normal sources of iodine for the human body one writer speaks of three, namely, the rocks, the sea, and the atmosphere by way of the sea spray. From this point of view parts of the country have been laid out geologically and it is postulated that iodine has been completely leached out of those parts, largely due to the Great Ice Age. Therefore, iodine will be lacking in these waters, and hence goiter will be common in these districts. It has been found by analysis that some of the waters of the southern states may contain upward of 18,000 times as much iodine as the waters of some of the northern states. Hence to some it would seem only necessary for us to take a geologist by the one hand and a bag of iodized salt by the other, and by feeding the salt to everybody wherever the geologist directs, wipe out simple goiter.

The highest pitch of enthusiasm seems to me to have been reached when one earnest worker in this field in 1924 in the United States Public Health Reports stated that "It has also been recommended that the Board of Health (in Cincinnati) favor the enactment of a statute requiring the iodizing of all table salts in the United States, thereby insuring uniformity of the product and restoring to common salt one of the important ingredients which when naturally present, is invariably removed in the process of refining. A proportion of one part of iodine compound, such as sodium iodide, to 5000 parts of salt apparently satisfies the requirements."

This plan is so naive and simple that it reminded me of the statement I heard as a boy, made by an enthusiastic bishop in a lecture upon missionary work. He said, "We will Christianize China, if necessary, at the point of the sword"! As I say, I was only a boy, but I felt much the same as the editor of the United States Public Health Reports seems to have felt. He expressed himself in an edi-

torial note as follows: "The amount of iodine recommended by the author cannot naturally be accepted as a definite and proper one for meeting normal human requirements. It may serve, however, as a point of departure for further observation and study, as a result of which more definite information may be obtained and a possible standard fixed. While the Public Health Service regards the use of iodized table salt for goiter prophylaxis as very promising, it feels that the establishment of a nation-wide standard will depend largely upon the practical demonstration of the harmlessness of the procedure and its demonstrated efficiency in preventing endemic goiter."

In 1925 a goiter survey was made of school children in Connecticut. Here is a saline State. If all is well with the philosophy beneath the naive and simple plan of iodizing us all with iodized salt then Connecticut should show scarcely any goiter. The sea is at hand, its spray blows over the State, and our geologist says he sees no reason why we need salt the citizens of Connecticut to save them. We tie up our bag of iodized salt and await the results of the survey, which results are a foregone conclusion, for our theory or hypotheses gives us in advance full knowledge of what to expect. We are in the position of those who associated the outbreak of diphtheria in Ireland with failures of the potato crop and who expected diphtheria the next time the potato crop failed.

In 1926 we read the report as follows: "There appears to be no correlation, in so far as the present study discloses, between the prevalence of thyroid enlargement and the principal geologic formations in Connecticut." At this point the *Journal of the American Medical Association* expressed itself editorially as follows: "Most of the so-called thyroid surveys among children of school age have been conducted in regions where a high incidence of endemic goiter might be expected. They have served for the most part to fortify the purposes of the advocates of prevention. A recent survey of 28 localities in Connecticut by experts of the United States Public Health Service indicates what may be expected in essentially non-goitrous areas. Accepting the iodine-deficiency theory of simple goiter causation, one would expect this State to show relative infrequency of thyroid enlargement; for the proximity to the seaboard and the excellent transportation facilities for readily obtainable sea food and other iodine-containing dietary articles, makes a serious deficiency in iodine improbable. In all, there were 2347 thyroid enlargements, a percentage of 18.9 among the 12,405 children examined. As usual, the incidence

was decidedly greater among the girls. So far as the present survey is concerned there appears to be no section of the State of Connecticut in which endemic thyroid enlargement is more prevalent than in another. The figures quoted may be contrasted, for example, with the incidence of 58 per cent. in the Minnesota survey, or 33 per cent. in Cincinnati. There appears to be no correlation between the prevalence of thyroid enlargement and the principal geologic formations in Connecticut. The situation there is one that, in the opinion of the consultants, does not call for the institution of State-wide goiter prophylaxis through the use of iodized water supplies, iodized table salt, or wholesale distribution of tablets containing iodine."

Again, we read: "Whenever a new discovery is reported in the scientific world the danger of improper or unwise exploitation soon looms ahead. The realization of the importance of a supply of iodine for proper thyroid development and function presently encouraged all sorts of attempts to supply the lacking element, particularly in those regions where shortage might be expected to occur. As a consequence, iodized salt, iodized drinking water, and iodized foods of various sorts were offered for use and exploited with an ardor not entirely devoid of potential dangers of over-medication. There is not only a possibility, under such conditions, of ingestion of iodine in quantities that may actually be detrimental to some persons rather than universally beneficial, but also the likelihood that the indefiniteness of such dosage methods may fail to secure the ideal therapeutic effects in persons actually in need of the material. Hence the *Journal of the American Medical Association* has tended to advocate methods of goiter prevention that involve definite dosage with iodine-bearing products of known composition rather than miscellaneous intake through specially iodized foods and drinks. The wisdom of this position has already been indicated by the occasional reports of ill effects from undue iodine intake."

The reasons for this editorial caution are many. First and foremost, iodine is a poison and iodism properly has its place in the science of poisons called toxicology. The sole excuse, if any there be, for assuming that 1 part in 5000 is too little to hurt is ignorance of whether it will harm or will not harm. The assumption could be urged only with a complete disregard of the warnings in the literature on the subject. Those of us who have been hurt have paid for our overconfidence in those who proposed the measures.

It is well to state that the iodized salt campaign in the United States superficially seems tolerable from the fact that the Swiss goiter commission of 1922 recommended an iodized salt; but you must know that the Swiss recommendation was for a salt only one-fortieth as heavily dosed with potassium iodide, that is, 1 : 200,000. In Michigan this amount was thought to be entirely inadequate, so the State Health Department assented to the larger amount!

The question of how much iodine is dangerous, I believe no one today could answer. Certainly if one is sensitive to iodine a most minute amount will produce a most marked reaction. The Philadelphian, Sajous, who perhaps deserves as much credit in this connection as any man because he spent his life largely upon the study of the glands, states in unmistakable English his opinion: "The nearer the individual approximates to normal health the greater are the chances of his developing iodism." Iodine is particularly dangerous because it is a cumulative poison. This has been demonstrated by experimental measures.

The data of the iodized salt campaign suffices in a sense to warn the reasonable. Apparently the minute amount of 23 parts of iodine per one hundred thousand million in the drinking water corresponds to an environment that suffices to correct the thyroid.

The untoward effects of the unrestricted use of iodized salt are just finding expression in the literature. We read from Detroit, Michigan, an opinion by McClure: "From my analyses I conclude that the use of iodine promiscuously in table salt, in the effort to prevent simple goiter, may be harmful."

Again from Hartsock, of Cleveland, Ohio: "Both Dr. Crile and Dr. Phillips of this Clinic are deeply interested in the subject, and they agree with me that . . . the community use of iodine may produce, especially in adults, an incidence of thyroid disturbance of greater economic importance than the evil it is designed to abolish, and that the general use of iodine will never be free from danger unless it is supervised by the medical profession. . . . Community administration of iodine disregards physiologic facts. . . . The use of iodized salt, in particular, should be discontinued, or limited absolutely to periodic table use by children under the age of puberty."

And lastly, an opinion by Shelmire, of Dallas, Texas, who describes seven cases of acne of the face, all in women past the "acne age." These followed the ingestion of iodized salt (not prescribed by a physician in any instance) for a period of six weeks to one year. One

patient, after being cured and temporarily discontinuing the use of iodized salt, returned for treatment after one year, consequent upon taking up again the use of iodized salt. A return to the use of ordinary table salt usually results in the complete disappearance of the eruption.

In the *Journal of the American Medical Association,* in response to an inquiry, the strength of iodized salt is given as 1 part in 10,000, but the product of one of the large salt companies, it is stated, contains 1 part of potassium iodide in 5000 of salt. The staff writer adds: "the indiscriminate use of iodized salt without medical supervision is, of course, not to be recommended."

It is not the purpose of this lecture to discuss the usefulness of iodine as a drug. If it is to be given to the expectant mother so as to prevent the birth of a cretin or of a child who will otherwise have a diseased thyroid, every sane man and woman will withhold criticism. If iodine mitigates certain other conditions, let it be used; but tonight we are interested in iodized salt as applied indiscriminately to populations . . . and at the point of the public health sword.

The outcome of the Connecticut survey showed that in a non-goitrous State, by the same standards used for goiter in surveys in goitrous States, there were 19 per cent. of the school children goitrous. One of the questions this result raises is, "When is a goiter not a goiter?", and we do not know who could answer it. "The size of the normal thyroid gland is not known." For this reason there remains a question where the normal thyroid stops and goiter (abnormal thyroid) begins. Even when the normal adult size is theoretically established it must be considered that the normal adult sizes at different ages in various parts of the world are not known. Remembering the intimate relation of thyroid to sex glands, it seems indisputable that the normal size of the thyroid gland cannot be stated. Every one of us who knows the elements of statistics knows the outstanding weakness of statistics of attributes. "Where attention is paid to one attribute alone (only) two mutually exclusive classes are formed." "It may be noticed that the fact of classification by some investigator does not necessarily imply the existence of either a natural boundary or a clearly defined boundary of the two classes. The boundary may be wholly arbitrary." Each individual must be held either to possess the given attribute or not. "The division may be vague and uncertain; sanity and insanity, sight and blindness, pass into each other by such fine gradations that judgments may differ as to the class in which a given individual should be entered."

Aside from this question involved in any and every study of the statistics of attributes, including therefore, endemic goiter, a question we should ask is, "Does the proposed remedy, namely, iodized salt, applied to population correct the supposed evil, namely, simple goiter?" Here we must limit ourselves to experience in the United States, for the experience in Switzerland has involved the use of an iodized salt only a fraction as strong as that used in the United States. The proper experimental answer comes somewhat as follows: We make a survey of the school children, we apply the remedy for some time, and we make a re-survey. The re-survey should tell the tale. Such a re-survey has been made in Cincinnati after a term of three years. I quote from the U. S. Health Reports:

"The aggregate incidence of endemic goiter in 1927 was only slightly less than 1924. . . . It may be surmised that iodized salt was a factor in the slight reduction of goiter revealed by the 1927 survey. The total per cent. of thyroid enlargement among the boys in 1924 was 26.6, and it was 22.5 in 1927; among the girls 39.8 in 1924, and 39.3 in 1927."

Now we must remember in our analogy that we were reasoning about administering phosphorus, not only to cure the thoughtless but to insure an excess supply of phosphorus available to the thoughtful. In Cincinnati the re-survey does not, and of course, cannot show, how many or how few of the healthy were helped to remain healthy because they had an available excess of iodine for their thyroid at all times. However, we have already called attention to the untoward effects on normal adults. We freely grant a rational expectation of higher figures for goiter in children in States where the draft showed higher figures in men of military age . . . provided the same standard is used in classifying. But equality of standard would be difficult, for we understand "a military goiter" is such an enlargement as will prevent the wearing of a military collar. It would obviously be hard to fit military collars on boys and girls.

Assuming iodized salt to be the remedy correctly indicated for treating goiter and assuming it to be as weak and harmless as are most other patent medicines, we now ask where to buy it. Where can we get the needed remedy for this disease? In the drug store? No; to our surprise the answer is, "In the grocery store"! If we ask how it is that such a potent drug as potassium iodide is sold promiscuously and is allowed to come to every member of the family—in fact, is

urged upon them by cogent advertisement—the reply is: It is a Public Health measure.

Public Health measures derive their force from the Police Power of the State. In matters not specifically covered by the constitution of the United States or by statute, this Police Power is controlled only by common sense, and upon appeal the courts give an opinion as to the reasonableness of measures carried on under it. The right to restrain you in your individual liberty when in the exercise of it you are a menace to others, is included in the Police Power. At times the use of the Police Power has been overdone.

Recalling our biological friend before we thank him and bid him good-bye (for he has served as a guide even if our quest has not led anywhere), we should learn from him of some other theories of goiter besides the iodine theory. It has been thought at various times that goiter was due to fluorine or to silica or magnesium salts, or magnesium and calcium salts jointly, or iron sulphide or copper sulphide, or some other metallic sulphide. Waters in limestone districts have often traversed metalliferous strata. Michigan and regions near the Great Lakes seem to illustrate this. Radioactivity has come in for blame for goiter. Recently the chlorination of drinking waters has been attacked as the supposed cause. A striking group of facts is that boiling water or heating it to 80° C. deprives it of goitrous qualities, while filtration through a Berkefeld filter does not.

The ill effects of iodized salt are double—those upon persons having hyper-thyroidism and those upon persons who are normal. Ill effects upon the first group we leave to the medical profession. Confining attention to the second group, since the problem here concerns populations, we have a few remarks to add. If Johnnie or Jane needs a dose of medicine during adolescence there seems to be no good reason why Father and Mother and Sister and Brother, and even Grandpa and Grandma, should take the same dose, particularly when danger attends the use of it because of its insidious effects. Too little is yet known to warrant a shot-gun procedure. Some States may be accused of dosing everybody with a medicine about which little is known, for a disease about which less is known, through the agency of some who may know little or who easily disregard what others thus far have learned.

THE COMMERCE OF CHEMISTRY*

By J. N. Taylor

Chemical Division, Bureau of Foreign and Domestic Commerce
Washington, D. C.

A GLANCE at the pages of history will show the close relationship which chemistry has held with the advance of the human race. From earliest times, as evidenced by Biblical records, as well as by the monumental records of Egypt, and the writings of Herodotus and Pliny, chemistry as an art played an important part in the life of *ancient* civilizations. Even as late as the fourteenth, fifteenth and sixteenth centuries the alchemical system attained widespread favor, and, as in the ancient Egyptian temples, chemical laboratories were to be found in Christian monasteries.

The chemist in the past has been somewhat inclined, like his illustrious predecessor, the alchemist, to lock himself up in his laboratory and keep his secrets to himself. In more recent years, however, he has come out into the light of day and now presents the results of his studies before meetings of our society and publishes his results in our journals.

Comment upon the retiring nature of the alchemists' successors, however, should not be taken in any sense as decrying the dispositions of our "fathers in chemistry" or deprecating their labors. None of us would think of criticizing the scientific habits of Boyle, Priestly, or Bertholet; of Liebig, Kekule, Pasteur, or of many of those who came after.

Many of these and other illustrious men did apply the results of their researches to practical ends and the Industrial Revolution caused many industries to establish chemical laboratories at their own works. It was not until the trade associations came into being, however (particularly those forms of cooperative organization covering highly specialized fields), that capital may be said to have pooled its resources with chemical science, looking toward the establishment of a community of interests. Scientific sections were organized and technical research instituted and the beginnings laid for studies that were later to advance both chemistry and commerce. Today there is hardly a

*An address delivered at Richmond, Virginia, May 2, 1930, before the Virginia Section of the American Chemical Society.

university in the country but has its fundamental and applied research available for industry or in the form of fellowships. For example, one well-known movement, sponsored by capital and initiated and administered by Professor Duncan first at the University of Kansas, later manifested itself in the establishment in 1911 of the Mellon Institute at the University of Pittsburgh with Dr. Duncan as the first director.

II.

President Hoover, while Secretary of Commerce, in advocating and initiating the assembling of the $20,000,000 fund for research in pure science to be expended over a ten-year period by the National Academy of Sciences, insured, in his characteristic, practical way, the continuation of industry's source of strength. The reservoirs of knowledge must not dry up. The streams and rivulets flowing into the power basin of commerce must continue in volume. Fundamental research must go on and chemistry, while continuing its industrial cooperative program, must not be neglectful of pure science.

Nevertheless, while fundamental research is necessary for further progress and while applied science must continue to be fostered, the resulting products of discoveries and inventions so made must be distributed in order that those who wish them may have the opportunity to get them. It would seem therefore that just as the second phase of the Industrial Revolution called for the more intensive services of chemistry, so today in still another phase of our industrial life a new science has developed calling for a sympathetic understanding between Chemistry and Commerce, a mutual relationship between chemical production and distributive mediums. In chemical parlance, the relationship partakes of the nature of a "reversible reaction" in that the fortunes of the one are bound up with those of the other.

So, the industrialist of vision establishes and maintains a department not only devoted to working out problems involving plant operations but also the coordination of this department with other technical departments and with the development and sales organizations.

At the last New York meeting of the American Association for the Advancement of Science, Dr. Redman presented a very interesting study in which he discussed mortalities in the several stages of a product between the time of invention and the time of successful distribution. While one would not go so far as to say that all of these deaths could be averted, it seems reasonable to presume that economic

research should diminish the casualties. Obsolescence, the price of progress, can certainly be met just as problems of supply and distribution are met and surmounted.

This necessity for a larger knowledge of economic conditions as they affect the chemical industry has evolved a new order of workers made up in large measure of those possessing both commercial and chemical training. It has introduced a new chemist classification.

Perhaps it may not be necessary for the chemical marketing specialist to have a chemical training, but basic knowledge of chemical science and its nomenclature should be extremely helpful in considering the fundamental aspects of chemical processes, the relation of one product to another, the possibilities for new and more efficient applications of them, as well as a more intelligent understanding of economic and commodity trends. Through these influences and trends, chemistry is recognized as basic to all industry and *chemical* industry today exercises a profound influence upon the *political* economy of the world.

III.

Economic trends or commodity tendencies may be caused by several factors, abong which may be noted, (1) the influence of other industries upon chemical evolution, and (2) the intrusion of synthetics into fields of use already occupied by natural products. To these factors of outstanding interest to the chemist may be added (3) those of availability of natural resources, and (4) waste and co-product utilization.

Consider how the automobile has affected chemical trends. It has caused a demand for more durable materials, for new and brighter colors, and new and better protective coatings. These latter have demanded solvents answering certain exacting specifications. The automobile industry is responsible for the development of anti-knock agents used as motor fuel constituents embracing a variety of substances useful for that purpose. Increased production of artificial leather followed the greater output of motor cars. This greater output was also reflected in a larger consumption of synthetic resins. Another industry that has affected the trend of certain chemical commodities is the rayon industry. Rayon—itself a group of chemical compounds—has exercised an influence over cellulose and the acids, both nitric and acetic. The demand for acetic acid, for instance, increased to such an extent that calcium acetate had to be imported to

satisfy the demand for the raw material despite a continued growth in synthetic production as well.

Not so long ago the number of synthetics entering into competition with natural products was small, but the rapid progress in chemical discovery adds new ones to the list almost daily. Ammonia, acetic acid, methanol, ethanol and the aromatics are just a few. Glycerine is confronted with glycol and butyl alcohol faces internal dissension. Citric acid from fruits faces the constructive activities of the molds. The scene of natural camphor production will quite probably shift from the wild highlands of Formosa, where live the head-hunting savages, to more refined scenes of synthetic production.

Every State and Territory in the Union is endowed with a wealth of natural resources, ranging from mineral deposits to forests and power sources. Abundant deposits of salt and gypsum, pyrites and sulphur, are to be found in certain localities; oil, coal, gas and limestone; clays, phosphate rock and bauxite in other. In short, our natural resources comprise practically everything to be found in a textbook on Economic Geology. The animal and vegetable kingdoms, likewise, to a great degree contribute a variety of materials which after processing finally enter into Commerce.

Utilization of wastes and collateral products is constantly changing our ideas as to what are main products and what are by-products. Once, kerosene was the principal product of a petroleum refinery; now, the situation is reversed. Hydrochloric acid at one time was allowed to escape as a waste gas. Uses found for it soon made it a main product. The oils obtained from by-product coke ovens are today in as great demand as the residual product of distillation. Chemical history is replete with these reversals in relative economic importance of manufactured products.

IV.

The consequent appearance of *new* products and the larger *application* of *both* old and new ones, has brought about a situation not comparable with that of any previous period in history. The incidence upon life of enormous quantities of materials having manifold uses must be characterized as truly great.

In the twenty-five year retrospect of the American Chemical Industry, recently issued by the Chemical Division at Washington, and in Professor Munroe's great work on chemical technology prepared

for the Bureau of the Census in 1899, there are presented more than the mere chronology and statistics of the industry. Considering these along with the younger Silliman's contribution to American Chemistry, presented at the Northumberland celebration in 1874, it would be possible to write the history of American chemistry.

The magnitude and scope of chemical industry today is tremendous when compared with that of a hundred years ago, even indeed within the past *quarter* of a century. A comparison of the 1899 production figures with present day ones will afford an idea of how far we have traveled since that time.

Consider just a few outstanding examples:

	1899	1927	
Acetic acid	$ 400,000	$ 5,500,000	(for sale)
Nitric acid	1,500,000	3,500,000	"
Sulphuric acid	7,300,000	43,000,000	"
Mixed acids	1,100,000	3,800,000	"
All sodas and compounds	11,600,000	114,000,000	
Alums	2,400,000	9,500,000	
Cyanides	1,600,000	6,300,000	
Fertilizers	42,000,000	190,000,000	
Paints and varnishes	54,000,000	500,000,000	
Explosives	17,000,000	72,500,000	
Plastics	2,100,000	28,000,000	

Sulphur in the 1899 figures included pyrites, and production aggregated a value of $543,249 dollars. 1927 production of sulphur *alone* was valued at over $38,000,000.

Rayon, first exhibited at the Paris Exhibition in 1889, is now a firmly established industry, total United States production in 1927 amounting to $110,000,000.

Medicinal and toilet preparations, crude drugs, essential oils, waxes, matches, and a multitude of other commodities have also seen a remarkable development.

We cannot leave this discussion of the rise of the American chemical industry, however, without mentioning a branch constituting a key industry and occupying an important position in the chemical life of the nation—the synthetic organic chemical industry. In 1880, when the first mention was made in the census returns of coal tar dyestuff manufacture, production amounted to 80,518 pounds of aniline dyestuffs. Expansion since the World War presents a magnificent record, preliminary figures for 1929 indicating the production of

domestic dyes to have been approximately 110,200,000 pounds. Production of organic photographic chemicals totaled 581,000 pounds; synthetic flavors, 2,290,000 pounds; synthetic perfume materials, 1,596,000 pounds; synthetic phenolic resins, 31,471,000, and synthetic coal-tar medicinals, 5,000,000 pounds. An industry that can offer to purchase for a country, with one of its secret remedies, great areas in the tropics is not an industry to be neglected.

We have compared the present with the past in terms of production. A story of the expansion of our foreign trade would also read like a romance.

Today the world is our market place and we are sending to all parts of the globe chemicals and allied products valued at over two hundred million dollars a year. On the other hand, our imports of materials for use in chemical and allied lines aggregate over two hundred million dollars annually, two-thirds of which are either exotics or supplements to our inadequate domestic supplies requisite for the promotion of our industry.

The saturation point is not in sight. Production is limited only by human needs and desires and our economic horizons are constantly being pushed back in order to supply the rational cravings of teeming millions not yet acquainted with modern necessities, to say nothing of some of the luxuries.

V.

The forward movement in American industry has been accelerated in recent years by a greater Southern participation. The creation of a New South, a new industrial South, has resulted from a recognition of its vast potential resources and the availability of cheaper power and new methods and lines of transportation. Other contributing factors are the supply of native labor, freedom for expansion and widening markets. This new state of affairs is reflected in a production value for all industries in the South in 1927 (the last census year) of $10,371,000,000, about one-sixth constituting chemicals and allied products.

The textile industry particularly has exhibited a southward movement and the processing of natural fibers and the manufacture of artificial ones—essentially chemical processes—has been an important development. The cheese industry since the practical eradication of the cattle tick has moved in a southerly direction. Coincident with these migrations there has been the establishment of other new

industries. Expansion of old ones is reflected in the carbon black and the naval stores industries; and to the vegetable oil industry has now been added tung oil. Finally to supplement increased phosphate rock production we have another fertilizer material—fixed nitrogen—added to the South's list of products. Carbon bisulphide is expanding, diphenyl is no longer a laboratory curiosity, and cotton weed bran, the lowly peanut-hull, and the Jerusalem artichoke will probably be converted into xylose on a commercial scale.

VI.

Statistical data for the South in general and Virginia in particular have been so admirably presented by one of your section, Dr. Hitchcock, that it is unnecessary here to more than mention the leading position occupied by Virginia in the production of chemical and allied products and to note some opportunities worthy of consideration.

"Down Where the South Begins," here in Virginia, you have entered into a new age. Already known as the "Mother of Industry on the American Continent," the State in which "were established the first salt plant, the first glass works, the first leather tannery," you now have added another type of "first," first production of rayon. You will also, it is said, soon be able to guarantee United States independence of foreign nitrogen.

In 1927 the value of all products manufactured in Virginia aggregated $671,000,000, a 14 per cent. increase over the total 1925 value. Of the 1927 value, chemical and allied products aggregated $129,000,000, divided into twenty groups, illustrating the diverse nature of Virginia enterprise.

At the same time what has been done represents only a portion of what may be accomplished. A booklet recently issued by the Virginia State Chamber of Commerce impresses one with the great potentialities awaiting development. Water and rail serve not only a section that may be glimpsed from the deck of any steamer coming down the bay or in through the capes, but a vast territory to the north, west and south as well.

Hampton Roads Port is a gate of ingress to the West and South, and it is one through which a steadily increasing outflow of all sorts of materials will find their way to foreign fields. The Hampton Roads Port is especially favored by its location and the nearness to

the east and west coasts of South America and by the territory which it is capable of serving. Mutual requirements of this area and the United States should insure cargoes coming and going.

In the export studies included in the traffic survey previously mentioned is one on coal and the thought occurs that some could be processed in ovens and the by-products utilized. Coke production could mean a metallurgical industry and an increased tar production could mean more road materials and more domestic creosote with a short haul and perhaps an expanded creosoting industry. The manufacture of other products ranging from crudes to finished products, from motor fuel constituents to dyestuffs, is not incapable of consideration. The import study on cacao beans suggests theobromine and caffein, this thought in turn suggesting the field of fine chemicals. The molasses study suggests not only industrial alcohol but also images the booming solvents industry. Reflection upon the pork and pork products study visualizes slaughtering and packing house activities, with consequent production of biologicals, soaps and glycerine.

In addition to these suggested lines of chemical endeavor may be added casein, not only to supply the coated paper industry, but also as a basis for the casein plastics now finding wide application.

VII.

Suggestions such as the few just given inadequately present our possibilities. They seem so very meagre. Could we but transport ourselves into the future—let us say to 1950—we should, no doubt, be amazed at what had transpired in the intervening score of years.

The historical glance *backward* has shown us the great forward strides made since earlier times by American Chemistry. We are quite aware, too, that scientific discovery and invention are proceeding at an ever-increasing rate and in the light of history our progress in the future is to be more rapid than in the past.

The functions then, of *chemistry-in-the-future,* must be more comprehensive than at present and must certainly embrace an understanding of its economic importance. The service of chemistry must be not only in the discovery and the application of scientific and technological facts but chemistry must also serve by solving the larger problems of distribution in its broadest sense. We must lay more emphasis upon the *commerce* of chemistry, upon the economical distribution of chemical wares. New uses must be found for old prod-

ucts, old industries may justify expansion, and new ones would logically be inaugurated if deemed advisable.

It is not enough to visualize the great potential awaiting development—to view the perspective—and stop at that. Practical and efficient *methods* for bringing about the desired ends must be formulated and, happily, chemical industry itself, as well as governmental institutions, have made a beginning along this line.

A general method of approach, capable of specific application, of arriving at a program of effort, is through the *chemical-economic survey*. Such a survey, when completed, should show fairly conclusively whether or not a given material shall go into production, how long an industry can continue its current program, whether it should switch immediately or gradually, or whether it should pick up and move to some other part of the country.

In building the survey structure the technique to be followed will, of course, depend upon the problem at hand, but no matter what the survey, whether of some particular branch of industry or of some particular commodity or group within the industry, the foundation upon which the superstructure is to be raised must consist of immediate, reliable, adequate and permanent records.

VIII.

The Department of Commerce, because of its relation to other Government establishments and to industry, has at hand or can point the way to the many sources of information so important in determining the position or status of a specific chemical industry or commodity, or in determining their trends. Cooperation in this respect is gladly accorded through the Chemical Division of the Bureau of Foreign and Domestic Commerce, which, established eight years ago by Mr. Hoover when he was Secretary of Commerce with Mr. Concannon as chief, endeavors to render practical service in the application of commerce to chemistry.

Nearly every day one or more interesting problems are presented. Some one may ask, "How are the solvents?" or "What is the future of acetic acid and how?" Or the question may be "Where and in what quantities can rotenone containing plants be found? Has it been synthesized yet?"

The functions of the division are essentially trade promotive and do not include any of a regulatory nature. Through regional surveys and immediate services available in fifty-eight American cities the

Bureau assists domestic commerce. To promote foreign commerce the Bureau also has available the services of its fifty-six offices abroad and the collaboration of the consular service.

The information thus made available covers a multitude of points: Magnitude of the situation as affected by foreign competitors; climatic conditions; advertising; make-up and habits of the population; purchasing power; chemicals and allied products manufactured locally or other sources of supply. Questions related to transportation facilities, customs tariffs and internal regulations affecting the importation or sale of American products in oversea countries are looked into and reported upon.

In addition, the Bureau maintains lists of prospective agents in each country and keeps a complete commercial report on each one for the confidential use of American firms. Up-to-date information is not only given regarding trade conditions, but each week the Bureau publishes a number of "Trade Opportunities" which are inquiries from parties with a definite interest in buying who wish to get in touch with manufacturers here.

A thousand men are at your service in the four corners of the world to gather together data bearing directly upon foreign trade promotion, and at the Washington *headquarters* and the district and cooperative offices throughout the country you will find the Department's facilities at your disposal.

CATALYTIC OXIDATION OF MERCUROUS NITRATE SOLUTIONS BY CUPRIC ION

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Introduction

RECOGNITION of the introduction of possible sources of error through the presence of extraneous substances during the course of analytical operations, and their very material influence on the various procedures utilized, is the result of daily observation on the part of the chemist engaged in the fascinating intricacies of scientific research. Numerous factors, many of a divergent nature, require meticulous consideration and, frequently, subsequent confirmation by the experimental method to establish the selective effect they may be

capable of exerting upon the mechanism of reactions involving such familiar physico-chemical phenomena as dissociation, reduction, oxidation, and hydrolysis. The relation of these factors (contact of material with direct or diffused sunlight; action of atmospheric oxygen; absorption of vapors of chemicals from air of laboratory; and others) to definite changes wrought by the existence of foreign ions capable of inducing catalysis in the positively-charged particles of electrolytes, frequently followed by variations in the solubility product or by partial precipitation because of changes in hydrogen-ion concentration characterized by the hydrolysis of ampholytes, etc., becomes a matter of considerable importance in determining the ultimate effect of the phenomena enumerated in addition to those of adsorption and occlusion during precipitation, upon solutions of inorganic compounds—especially those in which an increase in valence is possible—when a strictly quantitative estimation of their constituents is deemed essential.

In the paper here presented, the author has devoted his attention to an important phase of what may truly be claimed to constitute "modern chemical activity"; namely, accelerated oxidation by the application of one of the numerous catalytic agents. The magnitude of this manner of conversion as applied to the production of many substances by the chemical industries can scarcely be overestimated; the hydrogenation of fats by the method of Sabatier is but one of the many examples involving the conversion of a body possessing no practical commercial value into one for which there is constant demand. In the present work, catalytic action of a distinct type will be considered: that produced by the action of specific impurities, frequently present in minute traces, upon solutions of chemical reagents. It is hardly necessary to add that such activity is undesirable, and certainly not sought! It was considered logical to endeavor to ascertain what effect, if any, the bivalent cupric ion would have upon the mercurous cation; prior knowledge of the rôle it has played in instigating the ready occurrence of oxidation in solutions containing metallic ions other than those of the volatile element added increased interest to the undertaking of the research. Every precaution was taken to recognize or eliminate the introduction of any of the factors discussed in the effort to obviate the probability of errors accruing from these prolific sources of inaccuracy.

Catalytic Activity of Ions

The author has described in a previous research [1] the selective catalysis of trivalent arsenic by the iodide ion, particularly when the latter is chemically linked to the potassium cation. It might be of interest to observe at this place that the presence of iodide ion, when utilized either as sodium iodide or manganese iodide, fails to produce with the same rapidity the catalysis sought as when potassium iodide is employed for the purpose. Similarly, during the course of the work described in this paper, extended experimentation developed the fact that the negatively-charged particle in combination with cupric ion undoubtedly influences most markedly the speed at which oxidation of mercurous ion occurs.

The observation was made that when cupric sulfate is employed in the capacity of catalyst, oxidimetric conversion is retarded to a remarkable extent; the proportion of mercurous salt undergoing change in valence is not greatly in excess of that quantity encountered in those solutions containing pure mercurous nitrate free of copper compounds. This condition also obtained when the employment of cupric chloride as catalyst was resorted to; however, the percentage conversion here was greater than that observed in the determinations in which the addition of cupric salt combined with the sulfate radicle was made; but not nearly so pronounced as when cupric nitrate is employed in a similar rôle. Apparently, a direct relation between the magnitude of the catalytic oxidation of mercurous nitrate and the concentration of cupric nitrate employed as catalyst, does not exist.

That the activity of cupric ion is not confined solely to solutions of mercurous salts is amply proven by the fact that sodium thiosulfate solutions quickly undergo quantitative oxidation to sodium tetrathionate by absorption of atmospheric oxygen in the presence of $[Cu++]$.[2,3] The writer has found (unpublished) that slight catalysis in thiosulfate solutions is likewise induced by the addition of $[Cd++]$, as $(CH_3COO)_2Cd$. The latter conversion, however, is not so apparent as when copper is used.

Analytical Methods

While it is possible to effect a quantitative separation of bivalent mercury from copper in very dilute hydrochloric acid solution of the chloride or sulfate,[4] experimentation developed the fact that this objective is better accomplished by the employment of acetylene;[5,6]

the introduction of which, in the presence of minute quantities of cupric compounds, produces a *colloidal combination* with the gas, existing as a sol which may agglutinate upon prolonged standing. This, apparently, is without effect on stannous chloride solutions which, it will be recalled, is the reducing agent generally employed in this connection. (It is of interest to note that copper has a most favorable effect as a positive catalyst in the oxidation of H_3AsO_3 to H_3AsO_4;[7] this action is somewhat diminished by the presence of [Sn + +] or [Sn + + + +]) (F. G. G., unpublished).

Determination of mercurous nitrate by von Zombory's modification of the Fajan method,[8] employing potassium chloride as precipitant, is extremely accurate and, therefore, was utilized in the experimental tests conducted. When tetrabromphenolsulfonephthalein is employed as indicator, the color change (transition interval) is from lilac to yellow at the transition point which, in this case, is practically identical with the equivalence point.

Purification of Materials

Specially prepared crystals of potassium chloride, repeatedly crystallized *under diminished pressure* resulted in the production of a product of high purity, in which the iron content was lowered to 0.0001 per cent., and the calcium (as CaO) and magnesium (as MgO) was decreased to less than 0.0001 per cent.

Redistilled mercury furnished the basic product employed in the manufacture of a salt characterized by the highest degree of purity. The subsequent production of $Hg_2(NO_3)_2$ was carried out with great care. The compound was crystallized and closely examined for possible traces of impurities before use. The amount of these was so extremely minute as to render them negligible.

The portion of nitric acid required to produce the soluble mercurous compound in addition to that needed to prevent hydrolysis in the prepared solutions was made by the *method of Mishchenko*,[9] this procedure insuring the absence of foreign matter.

Bromophenol blue of the requisite purity was obtained from a reputable house, and thoroughly examined before employment to ascertain its fitness for use as an indicator in the determinations carried out.

Procedure

An aliquot portion of each test solution was most carefully titrated with the potassium chloride reagent in the presence of bromophenol blue as indicator—employing a weight-buret—immediately following preparation. In the endeavor to eliminate relative discrepancies that might accrue as a consequence of the application of dissimilar methods involving varying degrees of sensitivity, etc., this procedure was repeated under the same practical conditions obtaining when it was first utilized: after the samples had stood during the specified period of time.

To prevent hydrolysis of mercurous nitrate to the corresponding basic salt, $Hg_2(OH)NO_3$, a small quantity of the chemically pure nitric acid prepared in this laboratory was added to the contents of each beaker. Proportionate quantities were so employed.

Experimental

Twenty test samples were now prepared, containing various quantities of mercurous nitrate to which was added a small portion of nitric acid; these solutions were absolutely free of copper compounds. The proportion of mercurous ion present in each sample was determined, and one-half of the containers permitted to stand undisturbed for the space of seven days; the remaining ten were allowed to stand, under similar conditions, for a period of twenty-eight days. At the expiration of the allotted time, the contents of the first series of beakers were carefully examined by the method first employed, and the data furnished in Table I observed:

TABLE I

EFFECT OF CONCENTRATION AND AGE UPON OXIDATION OF MERCUROUS NITRATE

(Each solution free of copper ion)

Volume of solutions: 100 ml. Interval: 7 days

Temperature fluctuation: 21-22° C.

Sample No.	$Hg_2(NO_3)_2$ present (gm.)	$Hg(NO_3)_2$ found (%)
1	0.1017	0.124
2	0.2009	0.117
3	0.3018	0.117
4	0.4006	0.134
5	0.5017	0.128
6	0.7007	0.109
7	0.9036	0.102
8	1.0021	0.096
9	5.0108	0.089
10	10.0014	0.072
	Average conversion	0.109 per cent.

The samples constituting the second series of test solutions were given precisely the same treatment accorded those previously examined, at the close of twenty-eight days. Table II shows the results of atmospheric oxidation occurring during this period:

TABLE II

EFFECT OF CONCENTRATION AND AGE UPON OXIDATION OF MERCUROUS NITRATE

(Each solution free of copper ion)

Volume of solutions: 100 ml. Interval: 28 days

Temperature fluctuation: 21-23° C.

Sample No.	$Hg_2(NO_3)_2$ present (gm.)	$Hg(NO_3)_2$ found (%)
1	0.1019	1.987
2	0.2018	1.876
3	0.3017	1.871
4	0.4001	1.682
5	0.5008	1.456
6	0.7016	1.286
7	0.9007	0.997
8	1.0018	0.991
9	5.0022	0.764
10	10.0009	0.578
	Average conversion	1.349 per cent.

Twenty additional samples of experimental mercurous nitrate solution were now prepared in identically the same manner as those considered in the foregoing tables; to each of these was added an amount of cupric nitrate (special crystals) chemically equivalent to 0.01 per cent. copper. Ten of the beakers containing the solution in which cupric ion was present were examined after the stipulated period of time and a determination of the extent to which oxidation had taken place, was made. Table III considers the results attained after the samples had stood for seven days:

TABLE III

EFFECT OF CUPRIC ION UPON OXIDATION OF MERCUROUS NITRATE

(Each solution containing $Cu(NO_3)_2$ =○= 0.01% Cu)

Volume of solutions: 100 ml. Interval: 7 days

Temperature fluctuation: 21-22° C.

Sample No.	$Hg_2(NO_3)_2$ present (gm.)	$Hg(NO_3)_2$ found (%)
1	0.1008	0.879
2	0.2006	0.871
3	0.3019	0.698
4	0.4013	0.673
5	0.5018	0.591
6	0.7007	0.487
7	0.9018	0.483 (a)
8	1.0004	0.387
9	5.0012	0.224
10	10.0016	0.179
	Average conversion	0.547 per cent.

(a) Slight hydrolosis encountered.

The same method of procedure as applied to the contents of the beakers representative of the twenty-eight days' tests showed that conversion of Hg′ to Hg″ is more pronounced here than when the period of time allowed for the occurrence of the phenomenon is curtailed:

TABLE IV

EFFECT OF CUPRIC ION UPON OXIDATION OF MERCUROUS NITRATE

(Each solution containing $Cu(NO_3)_2$ =○= 0.01% Cu)

Volume of solutions: 100 ml. Interval: 28 days

Temperature fluctuation: 21-23° C.

Sample No.	$Hg_2(NO_3)_2$ present (gm.)	$Hg(NO_3)_2$ found (%)
1	0.1012	5.678
2	0.2007	5.479
3	0.3001	5.188
4	0.4012	4.936
5	0.5006	4.759
6	0.7020	4.349
7	0.9004	3.872
8	1.0082	3.114
9	5.0031	2.465
10	10.0108	1.937
	Average conversion	4.178 per cent.

Attention is directed to the fact that the addition of pure distilled water (pH 6.2) to each sample was made to compensate for loss by evaporation during the seven days and twenty-eight days periods; this was considered essential in maintaining a constant relation of solute to solvent and a definite degree of acidity in the treated solutions under examination.

Discussion

The tabulated results embodying a determination of the relative effects of cupric ion as catalyst upon varying concentrations of mercurous nitrate solutions at certain intervals furnish, it is believed, sufficient evidence to justify the belief that the presence of the metallic ion increases, within a given period of time, the rate at which conversion of definite amounts of univalent mercury to mercury possessing a valence of two takes place. Further experimentation has resulted in the establishment of the fact that an increase in temperature tends to accelerate very markedly the speed at which oxidation occurs; as would be expected, hydrolytic action also is favored by increased temperature changes.

A brief discussion of the several better known theories promulgated to account for the phenomenon of catalysis may not be out of place here. The rôle of catalytic agent as played by certain substances is one that is but imperfectly understood, even in this enlightened age of chemical knowledge. While, by far, most of the bodies capable of playing the part of "chemical parson" are those of inorganic origin, a number of such compounds are found in the realms of the vast organic kingdom. It will be remembered that benzyl alcohol and nitro bodies have a pronounced action upon the speed of oxidation of solutions containing either the acid or neutral salts of sulfurous acid [10] while pyridine, the heterocyclic base, has been employed by the author to increase the yield of dimethyl-α-naphthylamine from α-naphthylamine and methyl sulfate.[11] On the other hand, it has been shown [12] that the slightest addition of 0.000005 M brucine chloride to an alkaline sulfite solution diminishes atmospheric oxidation to one-hundredth part, thus furnishing an excellent illustration of negative catalysis.

Several explanations have been advanced to account for the properties which these bodies possess of causing union between several others without undergoing any apparent change in themselves. One of these—expressed in its simplest form—advocates the theorem that such a substance is capable of uniting in a loose chemical combination with another, acting in the capacity of carrier by virtue of its ability to subsequently release the particle and causing it to rapidly combine with another of dissimilar character with which the catalyst is in contact. The more modern theory of "radiation" which Lewis, Perrin, *et al.*, have developed is founded upon the basic principles expounded by Arrhenius.[13] These workers concede that a reaction occurs only when molecular activation is instigated by infra-red radiation absorption. Only those molecules possessing an adequate supply of energy are capable of reaction during collision. A catalytic reaction, therefore, is one characterized by the absorption of infra-red radiation that is emitted by the catalyst at the moment of contact. According to Kolthoff,[14] induced reactions are to be thought of as running in a similar fashion. As is evident, changes induced by catalysis are not limited, by any means, to oxidation processes. Of practical interest, too in this connection, is the so-called "poisoning" of the agent by impurities during the course of which its efficiency becomes seriously impaired, or perhaps completely fails to function.

It has been shown that cupric ion displays a degree of catalytic activity in contact with mercurous ion that is, possibly, unsurpassed by that of platinum or nickel in their respective domains. Finally, it was considered desirable to ascertain the effect of employing minute portions of cupric nitrate in the presence of mercurous ion; the observation was made that a quantity as small as 0.001 per cent. hastened the reaction considered. The application of heat produced an acceleration of the same intensity as that experienced in the earlier examinations of the samples containing larger portions of cupric ion.

Summary

(1) Data are furnished showing the effect of catalytic action upon varying concentrations of mercurous nitrate solutions by cupric ion, after certain intervals of time.

(2) The presence of the bivalent ion in mercurous solutions acidified with nitric acid causes a pronounced acceleration of the reaction occurring between atmospheric oxygen and mercurous ion, whereby the latter undergoes conversion to the mercuric state. This change is further favored by dilution.

(3) The anion present in the cupric salt determines, apparently, the rapidity with which catalysis is induced. It is possible that differences in solubility, *dissociation, and indirectly related phenomena may account wholly or in part for this observation.*

(4) Increased amounts of cupric nitrate in excess of that proportion utilized as catalyst in this study do not materially affect the rate at which oxidation occurs.

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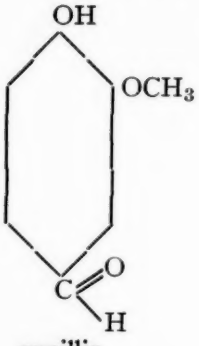
(5) Erdman and Makowka: *ibid.*, 46, 128 (1907).
(6) Waegner: *ibid.*, 44, 565 (1905).
(7) Reinders and Vles: *Rec. trav. Chim.*, 44, 29 (1925).
(8) von Zombory: *Z. anorg. allgem. Chem.*, 184, 237 (1929).
(9) Mishchenko: *Zhur. Prikladnoi Khim.*, 2, 521 (1929).
(10) Bigelow: *Z. physik. Chem.*, 26, 493 (1898).
(11) Germuth: *J. American Chem. Soc.*, 51, 1555 (1929).
(12) Young: *ibid.*, 24, 297 (1902).
(13) Arrhenius: *Z. physik. Chem.*, 4, 226 (1889).
(14) Kolthoff and Furman: "Theoretical Principles of Volumetric Analysis" (1928).

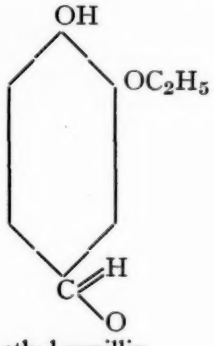
CHEMICAL REACTIONS OF ETHYL PROTOCATECHUIC ALDEHYDE

By J. L. Klotz, B. Sc., M. Sc.

ETHYL PROTOCATECHUIC aldehyde, a substance commonly known as ethyl vanillin, is a compound intended for use as a substitute for vanillin or methyl protocatechuic aldehyde. The two compounds are similar in structure, vanillin being the methyl ether and ethyl-vanillin the ethyl ether of protocatechuic aldehyde:

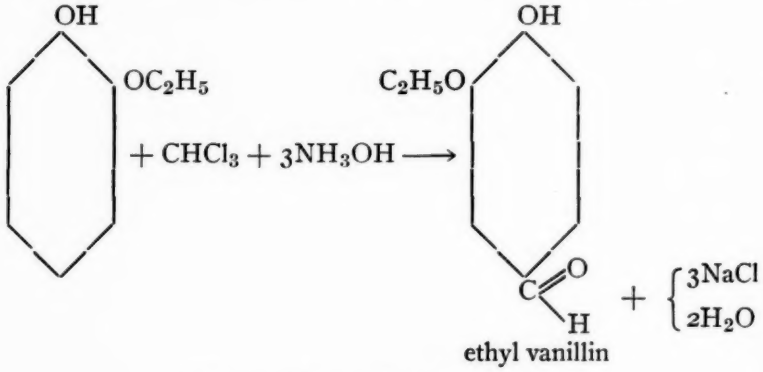


vanillin



ethyl vanillin

Ethyl vanillin is prepared entirely through synthetic processes, the most important of which are the Reimer-Tiemann reaction:



ethyl vanillin

(German Patent 81071—1895)

And the alkyl substitution process, German Patent 90305 (1897).

Chemically, of course, this compound is a substituted phenolic alcohol which would be expected to respond to various reagents in the same manner as does its related compound vanillin. However, since various compounds of the same classes often differ in their properties, the object of this work was to determine in what ways, if any, ethyl vanillin differed from other compounds of the same general formula. With this end in view, the following operations were performed:

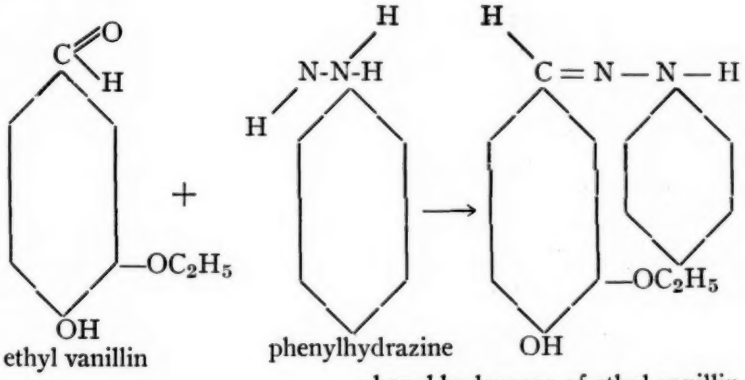
1. Determination of melting point.
2. Preparation of the phenylhydrazone.
3. Preparation of the dehydrodi-compound.
4. Preparation of the triphenylmethane derivative with indole.
5. Condensation with a ketone—
   (a) Acetone.
   (b) Camphor.
6. Condensation with an osazone.

1. Melting points were taken on vanillin and ethyl vanillin and the results were:

Vanillin M. P. 80-82 C.
Ethyl-vanillin M. P. 75-77 C.

2. Preparation of the hydrazone of ethyl protocatechuic aldehyde.

Phenylhydrazine in acetic acid solution was added to an aqueous solution of ethyl protocatechuic aldehyde. Precipitation of the phenylhydrazone occurred slowly and upon recrystallization yielded pure white crystals M. P. 124-126 C. (uncorr.).



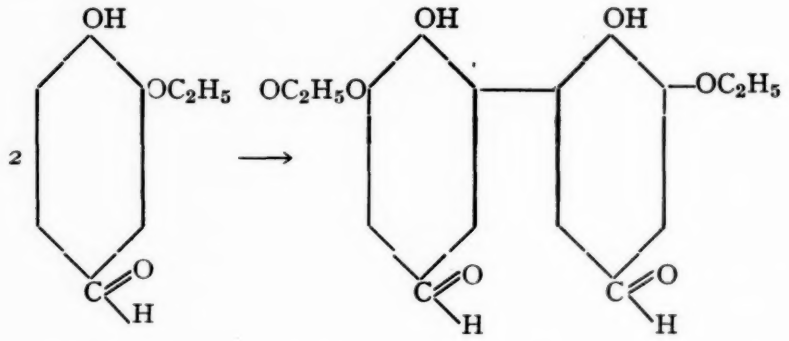
ethyl vanillin + phenylhydrazine → phenyl hydrazone of ethyl vanillin
M. P. 124-126 C.

3. Preparation of the Dehydrodi- compound.

The United States Pharmacopœia, Tenth Revision, lists on page 120 the following test for vanillin:

> "A saturated aqueous solution of vanillin gives a blue color with ferric chloride T. S. On boiling, the blue color changes to brown, and on cooling a white or nearly white precipitate of dihydrodivanillin separates."

Clark in his "Handbook of Organic Analysis" lists the same test but specifies the addition of a trace of hydrochloric acid before the addition of the ferric chloride. The compound in question was prepared in both ways with vanillin and ethyl vanillin, the latter method giving the more satisfactory results due to the fact that in an aldehyde condensation of this type traces of mineral acid greatly facilitate the reaction:



In the preparation of this compound a difference in the color changes observed between ethyl vanillin and vanillin follow:

Vanillin

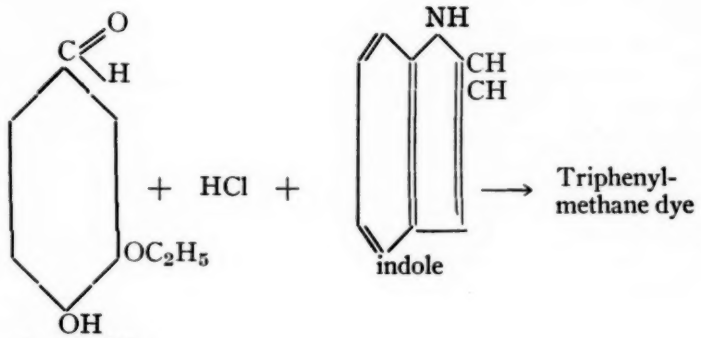
Colorless + HCl + $FeCl_3$ ⟹ Blue color + heat ⟹ Brown color + cooling ⟹ white ppt. of dehydrodivanillin.

Ethyl vanillin

Colorless + HCl + $FeCl_3$ ⟹ Green color + heat ⟹ Dark green + cooling ⟹ white ppt. of dehydrodiethylvanillin. M. P. 232-235 C.

4 Triphenylmethane Formation with indole.

According to Buard,* indole in the presence of hydrochloric acid and vanillin (alcoholic) gives a red coloration. Chemically, indole, due to its phenolic properties, condenses very easily and it is presumed that the brilliant color is due to the formation of a triphenylmethane derivative. Ethyl protocatechuic aldehyde exhibits exactly the same reaction:

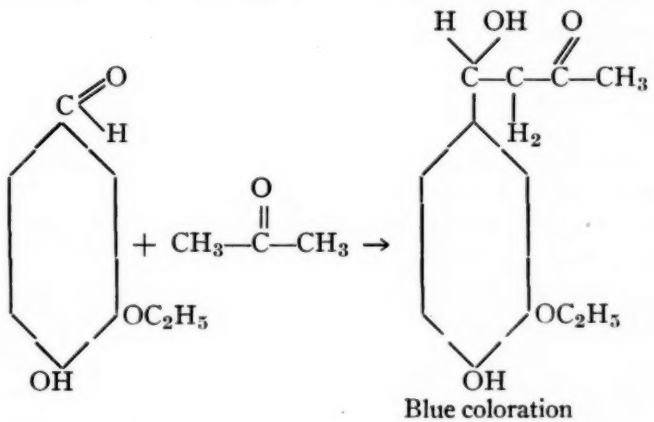


ethyl vanillin

5. Condensation reaction with ketones.

(a) With Acetone.

According to Allen,* vanillin yields a blue coloration with acetone in the presence of equal parts of hydrochloric and sulphuric acids. Ethyl vanillin responds similarly, the reaction presumably being:



Blue coloration

*Buard: *Compt. Rend. Biol.* (1908).

*Allen: "Organic Tests."

(b) With Camphor.

According to Bohrisch,** vanillin condenses with camphor (dextrarotatory ketone) to give a green color in the presence of HCl.

This procedure was run with ethyl vanillin and camphor and a positive reaction was obtained, the result being due to a similar reaction as that of the above.

5. Condensation with Osazones.

According to Jollé,* the osazone of levulose in the cold with vanillin and hydrochloric acid gives a red coloration. Ethyl vanillin gives exactly the same reaction for disaccharides.**

Interpretation of Results

From the above experimental data it is evident that ethyl vanillin is similar in almost every respect to vanillin:

1. Forms insoluble phenylhydrazone.
2. Forms dehydrodi- compound.
3. Forms triphenylmethane derivative with indole.
4. Condenses readily with ketones.
5. Condenses with osazones.

Thus for purposes of identification we must resort to the preparation of derivatives, *e. g.:*

	Ethyl vanillin	Vanillin
Phenylhydrazone	124-126 M. P.	105 M. P.
Dehydrodi- comp.	232-235 M. P.	M. P.

Summary

1. Preparation of phenylhydrazone of ethyl vanillin as a means of identification. M. P. 124-126 C.

2. Preparation of dehydrodiethylvanillin M. P. 232-235 C.

3. Compared reactions of ethyl and methyl vanillin.

4. Respectfully suggest: 1. Changing of the U. S. P. spelling of dihydrodivanillin to dehydrodivanillin to agree with the original article

**Bohrisch: "Organic Tests."
*Jollé: Ann. 1907, 35, 138.
**Schmidt: "Organic Chemistry."

as published in Berichte; and 2. Changing the U. S. P. ferric chloride test for vanillin in such a way as to provide for the addition of traces of HCl before heating with ferric chloride T. S.

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MEDICAL AND PHARMACEUTICAL NOTES

COOPERATION WITH HOSPITAL PHARMACIST—Inspection and study of the hospital drug room will be of interest and profit alike to the administrative and the professional members of the hospital staff. The superintendent will find here opportunities for justifiable economies the existence of which he had not suspected. Attending physicians will be surprised at the large amounts of proprietary drugs which they are unthinkingly using in place of equally effective and less expensive pharmacopœial preparations, often under the misapprehension that the widely advertised proprietaries were accomplishing more than the practically identical official drugs.

A closer acquaintance and cooperation between the hospital pharmacist and the members of the attending staff will be of mutual profit. The pharmacist will learn the problems which the staff has to meet, and the physicians can learn much concerning the composition and origin of new as well as of old remedies. In many hospitals the staff has failed to avail itself of the store of pharmaceutic information which may be had from the pharmacist for the asking, and the pharmacist has not taken as large a place in hospital conferences as he should. His function should not cease with the supplying of drugs called for on prescription and the detecting of inadvertent errors of dosage, but properly should be extended in an informative and advisory capacity, under instructions given by the staff and medical superintendent, so that hospital prescribing may be limited to remedies whose composition is known and whose use is approved by the best medical practice.

The correction of habits of prescribing proprietary drugs in hospitals will go far toward eliminating confusion and improving the medical education of internes, nurses, the public and the attending physicians themselves.—(E. E. Irons, M. D., *J. Am. Med. Assoc., 94,* 1278.)

DERRIS—The extended use of "Tuba" root in the preparation of proprietary insecticides has resulted in larger areas being devoted to the cultivation of this plant in the Federated and Unfederated Malay States. According to the annual report of the Agricultural Department for 1928, the area now planted in Johore is about 2000 acres, though only 700 acres are devoted to the crop in the Federated Malay States. From experiments carried out at the Serdang Experiment Station, where several species of *Derris* are cultivated, it has been shown that there is a wide degree of variation in the toxic content of the roots of the different species and varieties. The roots of *Derris malaccensis* Prain, commonly known as "Erect Tuba," are regarded as being more highly toxic than those of *Derris elliptica* Benth. ("Tuba puteh"). An interesting fact is that the fine lateral rootlets have been shown to possess a higher toxic content than the large roots in all cases. The most suitable time for harvesting *D. elliptica* is considered to be about two years from planting, for at this stage toxicity is at a maximum, but is inclined to decrease after this period. A ready sale is said to exist locally in Malaya for the air-dried roots, prices varying from 25 to 30 cents (Straits) per pound.—(*Kew Bulletin,* No. 1, 1930, 48, through *Pharm. Jour.*)

DETERMINATION OF SILVER ION WITH VARYING CONCENTRATIONS OF HYDROGEN CHLORIDE AS PRECIPITANT—Intensive study and experimentation has developed the fact that 0.15 N HCl constitutes the most satisfactory reagent for the strict quantiative estimation of silver ion. Solutions of lower normality exert a pronounced solvent action upon the undissociated compound of the univalent metal with the chloride anion; more concentrated solutions of the acid reagent tend to accelerate adsorption of Cl^-, and, in some instances, of the silver cation by the precipitate.

The potentiometer was employed throughout this study in making the essential chemical determinations. By this method an equivalence-point corresponding to the sought titration-exponent was readily ob-

tained, and the possibility of introducing errors because of indefinite color changes occasioned by the utilization of organic indicators eliminated. Traces of silver chloride adhering to the walls of each container following filtration were carefully removed, and then determined by nephelometric procedure. Corrections for temperature changes, solubility, etc., were subsequently made.

The results so obtained furnish, it is believed, conclusive evidence that the determination of silver ion with hydrogen chloride is most exact when 0.15 N HCl is employed as precipitant.—(Frederick G. Germuth, *Journal of the Franklin Insitute.*)

CANCER CONTROL HINTED IN SULFUR COMPOUNDS—The possibility of the long-sought control of cancer is suggested by a theory of growth promotion and inhibition by means of organic sulfur compounds, which was explained before the recent meeting of the American Philosophical Society at Philadelphia by Dr. Frederick S. Hammett, of the Lankenau Hospital of this city. Dr. Hammett did not advance any claim to having found a cure for cancer, but he did state that transplantable tumorous growths in mice had been caused to diminish, and in at least one case to disappear, byt the application of an organic compound containing partially oxidized sulfur.

Dr. Hammett's experiments have had a much more comprehensive aim than an effort at the solution of the cancer problem. They have been endeavoring to discover the chemical secret of all growth by cell multiplication. Some time ago he stated that he had found the stimulus to cell division in the chemical group known as sulfhydril, consisting of one atom of sulfur and one of hydrogen, which attaches itself to a large variety of chemical bases, including many organic and living compounds. By applying various substances containing this sulfhydril group he succeeded in stimulating growth in various plant and animal tissues.

A practical application of this discovery has already been made in the medical field, Dr. Hammett stated. One of his colleagues has tried a sulfhydril compound on obstinate open wounds and sores of various types, and the resulting rapid growth of new tissue has brought about the cure of a number of long-standing cases.

After he had satisfied himself that growth by cell multiplication is stimulated by sulfhydril, Dr. Hammett undertook to find out why such growth is checked under natural conditions. Since oxidation

processes go on rapidly in growing tissues, it seemed natural to infer that the sulfhydril compounds were oxidized, and that as they added more and more oxygen to themselves they lost the power to stimulate cell division. He applied various partly oxidized sulfur compounds to growing plant and animal tissues, as he had originally applied sulfhydril compounds, and found that the oxidized substances did cause a slowing down of growth. His successful experiments on the mouse tumors followed.

LABEL SUGGESTIONS ISSUED FOR SODIUM HYPOCHLORITE SOLUTIONS—Sodium hypochlorite solutions are effective as disinfectants or germicides in the absence of extraneous organic matter, but they cannot be depended upon to kill all germs including spores under all conditions, says Dr. C. C. McDonnell, of the Food, Drug and Insecticide Administration, U. S. Department of Agriculture. Therefore, claims on the label that the preparation will sterilize a surface or kill all germs, or unmodified claims such as "kills germs" or "destroys bacteria," or similar broad claims are objectionable under the Federal insecticide act.

The manufacturer is responsible for all efficacy claims on the label, Dr. McDonnell says, and all claims should be based on the results of adequate tests.

Sodium hypochlorite solution is widely used as a disinfectant in dairies, creameries and in bottling works. It is an effective germicide and harmless to humans when it is of the correct strength and properly used.

The labels on all insecticides and fungicides, which includes sodium hypochlorite, should bear no statement, design or device which is misleading to the purchaser in any particular. A statement must be given in conspicuous type of the name and percentage of each inert ingredient in the preparation unless the name and percentage of the active ingredient is stated, in which case it is sufficient to give the total percentage of inert ingredients. Under this clause of the act sodium hydroxide, in the amount usually found in this preparation, is not considered active. One correct way of stating this is the following:

Active ingredient, sodium hypochlorite	....%
Inert ingredients	....%
Total	100%

As sodium hypochlorite deteriorates on standing, the rate depending on composition, container, temperature and other factors, the manufacturer should make certain that the preparation will have the strength claimed at the time of sale to the consumer.

The directions accompanying the package for the use of this preparation as a disinfectant should make clear that it is to be applied only to clean surfaces. The presence of organic matter such as milk or cream in dairy utensils greatly reduces its strength.

A statement of phenol coefficient on the label of the preparation is not permitted because the potency of sodium hypochlorite as a germicide varies in use. In some cases it is much more powerful than phenol and in others it is less. It should neither be labeled "non-toxic" or "non-poisonous," unless the clause is added, "when used as directed."

A leaflet, "Labeling of Sodium Hypochlorite Solutions Recommended for Use as Disinfectants," can be secured by writing the Food, Drug and Insecticide Administration, U. S. Department of Agriculture, Washington, D. C.

ANTIFAT "CURES" WORTHLESS WARNS FEDERAL DRUG OFFICIAL—No drug or mixture of drugs known to the medical profession at the present time can be offered for the promiscuous use of the public in reducing weight without introducing an element of danger, warns Dr. F. J. Cullen, of the Food, Drug and Insecticide Administration, U. S. Department of Agriculture. "Promoters of so-called obesity remedies and fat reducing cures," he says, "are attempting to influence fat people to spend money for worthless or dangerous preparations. The advertisements appeal to the vanity of persons who wish to regain slim, graceful figures and also to the business necessities of those who become so fat that they can no longer do their work efficiently. The principal appeal of most of the promotion claims is that no dieting is necessary; the medicine is to do it all the advertiser says the patient can eat all he wants and as often as he wishes, which is a strong inducement to most stout people.

"These preparations frequently contain thyroid and laxatives. The promiscuous use of thyroid may prove very harmful unless given under the advice of a physician personally familiar with the subject's physical condition. The department has on record an instance where death has followed an overdose of a preparation containing thyroid.

Some preparations contain poke root (phytolacca), a poisonous drug, and others, analysis shows, contain nothing that could possibly have the slightest effect in reducing flesh.

"The promoters of one preparation assert that it secures most marvelous results by a process of elimination of foods without digestion. These people guarantee the reduction of a pound a day. A preparation of this character, if it did what its makers claim for it, would probably eliminate any need of digestion in the future. Another product, examination shows, consists principally of ordinary soap. The idea is to apply this locally with friction and thus remove the fat wherever it may be in excess. A still more clever scheme provides chemicals to be added to the water in which the patient is to bathe. These chemicals are of such a nature that they form a sort of curd in the water after the patient has bathed. This curd, the advertisement states, is fat and surplus tissue removed from the body. Other schemes offer tablets at 75 cents a dozen which are claimed to reduce fat at the rate of a pound a day.

"No other class of preparation exploited to humbug the people has a wider sale than these so-called fat reducers, and nearly all the preparations are absolutely worthless. Often patients seem to lose weight, but this is to be attributed to the hot baths and the diet and exercises recommended to accompany the medication."

Careful dieting and proper exercise are the only safe methods of weight reduction known to the Department of Agriculture specialists. Dieting and exercise, to be effective, they say, must be continued for long periods. In many cases other physical conditions make it unwise for fat people to try to reduce weight rapidly. As a general rule fat people should diet and exercise under the guidance of a skillful physician. Loss of flesh is by no means a blessing, Dr. Cullen warns, if accompanied by loss of health, energy or strength.

By exercise of its powers over interstate and import commerce the Food, Drug and Insecticide Administration has removed from the market many preparations falsely labeled for cure of disease and reduction of fat. Seizures and court actions have resulted in destruction of the goods and, in some cases, fines for the manufacturers. Most manufacturers have now revised their labels to comply with the Food and Drug Act. Some of the less scrupulous manufacturers continue to make false claims in advertisements, circular letters, pamphlets, and the like, not accompanying the package, over which the administration has no legal control. For their protection the Food,

Drug and Insecticide Administration advises purchasers to compare the printed claims on the labels of such medicines with other claims made by the manufacturers. If there is a discrepancy it is wise to depend on the label rather than on printed matter that does not accompany the package.

"RUSH" HAY FEVER TREATMENT—Just when the tiny pollen grains from early blooming trees are causing the season's first sneezes and sniffles among early hay fever sufferers, comes word from London of a new and speedy method of treating these unfortunates. The method is appropriately called "rush" desensitization by its author, John Freeman, director of the department of clinical bacteriology at St. Mary's Hospital, London, in his report of it to the *Lancet,* eminent English medical journal.

Earlier methods of treating hay fever victims have been too leisurely, according to this new suggestion. The treatments were begun long before the hay fever season started, and were given once a week for a number of weeks. When treating sufferers for whom there was no off season, because their attacks were due to some constant irritant, such as hair or dandruff from a pet cat, dog or other animal, Mr. Freeman developed a more intensive method of treating the patients every day with gradually increasing doses of the desensitizing vaccine.

He finally developed the "rush" method, which can be put through in from two to four days. The treatments are given every one and a half or two hours throughout a fourteen-hour day. The patient either goes into a hospital for them or has a trained nurse at home who can give the treatments and watch his condition carefully.

The first step in hay fever treatment is to determine what plant or tree pollen or animal or food protein causes the trouble in the individual case. Some persons are sensitive to more than one such irritant. When the offending pollens and other proteins are discovered, they are injected into the patient in tiny but gradually increasing amounts until finally his system has become desensitized to them and can tolerate them in the amounts usually present in the air of his environment.

The "rush" method has been used successfully for over a year, but has just been reported. Among those treated was a man who got asthma from the dust of his home. At first this agent was not sus-

pected, but it was found that as soon as he returned home after being discharged from the hospital apparently cured, his asthma started again as badly as ever. Finally he was treated with an extract made from the fine dust of his house. This was successful in relieving the asthma and he has had no serious attacks since.

Another patient was a small girl who wanted to ride her pony but was subject to attacks of asthma from horse hair or dandruff. After treatment she was able to ride daily without discomfort, although the treatment is still given every ten days or so.

A young boy had had bronchial asthma from a number of foods. He was undernourished and undersized because of the difficulty in feeding him. He was particularly sensitive to fish, so he was given rush inoculations with juices expressed from codfish. Now he can eat fish and has daily doses of codliver oil, which he likes. However, he must eat fish regularly or have occasional injections of fish vaccine to maintain his tolerance for this food.

COURT UPHOLDS OFFICIALS' POWER OVER DRUGS FOR IMPORT—The authority of the Secretary of Agriculture and the Secretary of the Treasury to determine whether or not certain crude ergot offered for importation into this country is adulterated or misbranded within the meaning of the Federal Food and Drugs Act, was upheld by the District of Columbia Court of Appeals May 5, in an opinion by Chief Justice Martin.

The Court of Appeals affirmed the action of the District Supreme Court which had dismissed an injunction proceeding brought by Howard Ambruster, a New York importer of ergot, to prevent the officials from admitting into the country crude ergot of rye which he alleges was illegal and unfit for use, and which would be in competition with importations made by him.

Mr. Ambruster claimed that he imported and has in store large quantities of standard ergot of rye and that he would suffer great loss if the ergot in question were allowed to be put on the market.

The Court found that the officials were vested with authority to pass upon the admissibility of the importations complained of and that the bill failed to allege facts upon which it could be inferred that the action of the officials in regard to the article involved was capricious, arbitrary, or in excess of their lawful powers under the statute.

CANCER MOST IMPORTANT PUBLIC HEALTH ACTIVITY—"Cancer is the greatest human problem of our time," declared Dr. Ellice McDonald, director of cancer research at the University of Pennsylvania Graduate School of Medicine, at a hearing before the U. S. Senate Committee on Cancer.

"Cancer is so important a menace that it is a public health activity and the most important public health activity at the present time. It is worthy of governmental expenditure and effort."

Dr. McDonald advocated the establishment of cancer centers on the lines of European cancer centers, where patients may be treated, where physicians and surgeons may be trained in the latest and best methods of cancer treatment, and where research on cancer may be carried on. The present high cost of radium, which Dr. McDonald called "the one best bet in the treatment of cancer" at the present time, limits its use very decidedly because hospitals and cancer centers cannot afford to buy it. Radium is now sold for $70,000 a gram in one-gram lots or for $50,000 a gram in four-gram lots.

"The radium needed for the United States for the treatment of cancer patients will be more than 100 grams, which under present conditions will cost five million dollars, but which, if it were properly applied in skilled hands, should save thirty thousand or more lives each year," Dr. McDonald stated.

Dr. McDonald recommended that cancer centers should be located in centers of population throughout the country and that they should be under Government supervision so that the equipment is complete and the medical personnel trained and skilled in radiation as well as in surgery. These cancer centers should have certain definite specifications and grants of money from the Government or collected by it, he advised, with control measures to avoid waste and useless expenditure.

If money is not forthcoming from the Government, a great deal could be done by the American Red Cross, he suggested, as the British Empire Cancer Campaign is maintained mostly by the money collected in a special cancer appeal by the British Red Cross.

"If a small amount of money alone is available it probably could best be spent in establishing a clearing house for cancer information as to improved methods of treatment, knowledge of new research, correlation of the phases of present research so that there would not be too much overlapping, and in maintaining a special cancer library

and library bureau where information on special phases of cancer could be supplied to research workers and to physicians who are treating cancer," Dr. McDonald said.—(*Science Service.*)

LABELING OF FLY SPRAYS—Fly sprays for animals are not "100 per cent. effective," or "safe," or "non-poisonous," or "harmless," and neither do they "prevent infectious diseases," nor do they "increase milk production" above normal, and if they are claimed to be effective for longer than eight hours they are open to question, says Dr. C. C. McDonnell, in charge of insecticide control, Food, Drug, and Insecticide Administration, the organization of the U. S. Department of Agriculture which enforces the Federal Food and Drugs Act, the Federal Insecticide Act, and other Federal regulatory laws.

"There is a marked difference in the action of sprays on various species of flies, and broad claims to the effect that a product is effective for all flies are unwarranted," says Dr. McDonnell. "In defining the action of fly sprays, a distinction should be made between preparations that actually kill flies and those that only repel them."

Not only must the label on fly sprays be free from false or misleading statements, but if the product contains any inert ingredients the label must state the name and percentage of each inert ingredient, or the name and percentage of each active ingredient and the total percentage of inert ingredients.

The insecticide officials of the Department of Agriculture are conducting a campaign to remove worthless fly sprays from interstate commerce, and to limit the labeling to truthful statements on the sprays which, by actual test, have proved to be effective.

The Department of Agriculture has just issued a leaflet on the subject, "Labeling Fly Sprays for Animals," a copy of which can be obtained from the Food, Drug, and Insecticide Administration, Department of Agriculture, Washington, D. C.

NEWS ITEMS AND PERSONAL NOTES

PROF. EDWARD KREMERS, REMINGTON HONOR MEDALIST—An outstanding feature of the convention of the American Pharmaceutical Association to be held in Baltimore, Md., the week of May 5, will be the award of the Remington Honor Medal to Prof. Edward Kremers, director of the course in pharmacy of the University of Wisconsin.

According to an announcement from the Drug Trade Bureau of Public Information, the medal will be presented to Dr. Kremers during the course of the annual banquet on the evening of May 6 at the Emerson Hotel. "Distinguished service to pharmaceutical education, extraordinary attainments in pharmaceutical research and untiring effort in the promotion of interest in the history of pharmacy" are mentioned among the reasons which prompted the Committee of Award to select Dr. Kremers for this high honor. The medal is bestowed annually by the New York branch of the American Pharmaceutical Association upon an individual who has given outstanding service to pharmacy. The presentation is in charge of the officers of the New York branch, which is presided over by Mr. Robert Gerstner.

Dr. Edward Kremers is a distinguished pharmacist and chemist. He was born in Milwaukee, Wis., February 23, 1865. He studied at the Philadelphia College of Pharmacy, the University of Wisconsin and the University of Göttingen in Germany. He holds the following degrees: Ph. G., Wisconsin, 1886; B. S., Wisconsin, 1888; Ph. D., Göttingen, 1890; Hon. Ph. M., Philadelphia College of Pharmacy; Hon. Sc. D., Michigan.

Dr. Kremers was appointed instructor in pharmacy at Wisconsin in 1890; professor of pharmaceutical chemistry in 1892; director of the course in pharmacy in 1899, and director of the State Pharmaceutical Experiment Station in 1912. He has written many scientific papers based upon original researches in the chemistry of drug plants and volatile oils and their constituents. He has also edited various publications including the *Pharmaceutical Review, Pharmaceutical Archives,* and Bulletins of the Wisconsin Pharmaceutical Experiment Station. He received the Ebert Prize for the best scientific paper read before the American Pharmaceutical Association in 1888 and again in 1900. He was chairman of the Scientific Section of the A. Ph. A. in 1898 and historian from 1904 to 1912.

Dr. Kremers has been a consistent and persistent advocate of a type of college training for pharmacists that would place pharmacy courses on a par with other technical courses in the university. He served as president of the American Association of Colleges of Pharmacy in 1902.

In addition to his very active work in pharmaceutical organizations, Dr. Kremers is also a member of the Wisconsin Academy of Science; the American Association for the Advancement of Science and the American Chemical Society. He has built up at the University of Wisconsin what is generally acknowledged to be the most complete library on pharmacy in the United States and the researches turned out by graduate students under Dr. Kremers' direction have been of a very high order.

P. C. P. AND S. ALUMNI TO HOLD 107TH REUNION—Tuesday, June 3d, is the day set for the annual reunion of graduates of the Philadelphia College of Pharmacy and Science. Reunions of alumni of the Philadelphia College have been an annual feature there since 1824. This year special features and entertainment are planned particularly for the classes of one year, three years, and five years ago, and also for each of the five-year classes for sixty years back. Graduates living in Philadelphia have been appointed local chairmen for these special reunions. These are:

1929 Paul B. LeCrone
1928 Joseph F. Cobello
1927 John E. Bohr
1926 Frank Brockman
1925 Ellis C. White
1920 Warren R. Weideman
1915 L. C. Scheffey
1910 J. C. Walton
1905 J. P. Remington
1900 C. L. Seip
1895 E. T. Hahn
1890 D. J. Reese
1885 A. G. Keller, Sr.
1880 S. W. Gadd
1875 Warren H. Poley

The program for the Alumni Day event at the Philadelphia College begins at 10:30 A. M. with a baseball game between the 1930 graduating class and the Alumni. Other events on the program are as follows:

10:30 A. M.	Baseball between graduating class and Alumni.
12:00 Noon.	Registration in main lobby of college.
1:00 P. M.	1930 Class procession and ivy planting.
	Box luncheon in college auditorium.
1:30 P. M.	Alumni meeting.
3:00 P. M.	General activities.
	Class stunts.
	Class of 1930, '29, '27, '25, etc.
	Horse shoe or quoits.
	Tennis.
	General field events.
6:00 P. M.	Buffet supper and cabaret.
	Dancing.
8:00 P. M.	Short dramatic skit by senior class Dramatic Society members.
9:00 P. M.	Dancing and cards.

BOOK REVIEWS

BETÄUBUNGSMITTEL UND RAUSCHGIFTE. By Prof. Hermann Thoms, M. D., Ph. D. Small 8vo., 192 pp. Urban & Schwarzenburg, Berlin and Vienna, 1929. 7.20 marks.

This compact and well-printed volume contains a large amount of information concerning familiar sedative and intoxicating drugs. Alcohol, tobacco, tea, coffee, maté, kola, opium, several of the mydriatics, general and local anesthetics, are described as to their production, properties and dangers. It is certainly fortunate for the mass of scientists that German scholars decided many years ago to print their books and journals in Roman characters. The language is itself difficult to those not to the manner born, and if its valuable literature was presented only in that type which Professor Whitney aptly called the "product of the perverse ingenuity of the monks of the Middle Ages," the grief of scientists of other lands would indeed be sore.

The text of the book is in general semi-popular, although the strictly scientific features are not neglected, structural formulas being

given. Much space is devoted to accessory topics such as the sociologic and political questions connected with the use and abuse of powerful drugs. In this respect the sections on alcohol, tobacco and opium are quite comprehensive. Thirty pages are devoted to alcohol, discussing production, commercial forms, properties, social and physiologic relations. Many authorities are quoted in the discussion, but, as might be expected, the principal issues are not definitely settled. Americans who wish to fit themselves for debate on the relative merits of temperance and abstinence, or the advisability of allowing the sale of light wines and beers, will find abundant data *pro* and *con* in this book. Similarly the chapters on the materials that furnish the cup that cheers but not inebriates have much informative data. Opium is given much space, in the course of which the "opium war" that Great Britain waged against the Chinese is described, an episode that history should blush to record.

Dr. Thoms has furnished a well-written and useful volume on subjects that are nowadays in the storm-center of American sociology and politics.

A critic must find some fault, if possible. The reviewer notes that Dr. Thoms has misquoted Schiller. He gives two lines from the poem, "Der Ring des Polykrates," the latter of which reads "Ward keinem Sterblichen zu teil," but the correct reading is "Ward keinem Irdischen zu teil."

HENRY LEFFMANN.

TRAVAUX DES LABORATOIRES DE MATIÈRE MÉDICALE ET DE PHARMACIE GALÉNIQUE DE LA FACULTÉ DE PHARMACIE DE PARIS. Edited by E. Perrot and A. Goris. Vol. 20, 1929, approximately 900 pages. 8vo. Vigot Brothers, Paris.

This valuable annual volume setting forth the work of the laboratories of the College of Pharmacy of Paris is a welcome addition to the all pharmaceutic libraries, presenting research work of the highest type in clear and excellent form. The present issue follows the usual plan of printing each essay with independent paging and marking the end of it by a colored sheet. This arrangement makes impossible the determination of the total paging without an arithmetical calculation, but approximation will serve.

Nearly half the volume is taken up with a comprehensive account of the indigenous and cultivated plants of French West Africa. This

contribution is, of course, more interesting and important to the fellow-countrymen of the editors, but there is much of general interest. The article is illustrated by photogravures. There is considerable information concerning the cultivation of plants not native to the region. This contribution is from the pen of Professor Perrot.

In the remaining portion of the volume the following essays are given:

A. Fourton	The acids of Digitalis.
M. Battino	*Argania spinosa* (L) Maire.
C. Favre	Chemical and physiologic determinations of *Conium maculatum* L.
Miss C. Bessé	Seeds and oil of *Ricinus communis* L.
E. Mathivat	Camaroon Chaulmoogra oil and oils of allied species.
A. Malmanche	Chemical and physiologic tests for aconite.

A series of brief articles on different topics by different authors.

Examination of the contributions shows that a very high standard of chemistry and pharmacology has been established in the research work, therefore the book will be of much value to workers in this field It is worthy of note that one of the contributions is from a member of the sex that was once man's superior but is now his equal. A comprehensive and detailed presentation of the many valuable data in the volume would exceed allowable space.

HENRY LEFFMANN.

A BRIEF INTRODUCTION TO THE USE OF BEILSTEIN'S ORGANIC CHEMISTRY. By Ernest H. Huntress, Ph. D., Massachusetts Institute of Technology. Pamphlet. 8vo., 35 pages. John Wiley & Sons, Inc., 1930. $1.00.

Beilstein's Organic Chemistry stands easily first among the mass of reference works in its vast field. The problem of producing such a volume is not only difficult from the amount of material at hand, but the arrangement and classification is also extremely difficult. In inorganic chemistry, apart from a few complex compounds, the mass of material is easily classified. Calcium carbonate will be found in chemistries under calcium, in mineralogies under carbonates. Even so simple a structure as phenol may have three systematic titles—

phenyl hydroxide, oxybenzene, hydroxybenzene. Many who have consulted the new edition of Beilstein, now in course of publication, have noted the difficulty of determining which volume to choose. Dr. Huntress has prepared a comprehensive introduction and explanation of the system of classification, which will be very helpful to those who have frequent occasion to use the monumental work.

H. L.